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| 09/624,385 | 07/27/2000 | Tatsushi Katayama | 35.G2626 | 9572 |

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|---|
| WANG, JIN-CHENG |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2672 | |

DATE MAILED: 09/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/624,385 | KATAYAMA ET AL. | |
| | Examiner | Art Unit | |
| | Jin-Cheng Wang | 2672 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Xiong et al. U.S. Patent No. 6,434,265.

3. Claim 1 recites an image synthesis method. The Xiong reference discloses a method for constructing a panorama from rectilinear images in 3D through projective registration and calibration including: (1) the projective registrations of overlapping images, (2) calibration and global optimization of these images, a self calibration in which 2D image planes are positioned as 3D planes in space, and (3) the composing or blending in which images are ready to be re-projected to a 3D environment map with pixels in overlap regions being composed from multiple images (column 4, lines 5-40). The Xiong reference further teaches that overlapping photographs are analyzed to determine what orientation the photographs were taken in order to establish a

common ground for subsequent operations and the panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane for viewing. The Xiong reference implicitly discloses some typical geometry on which panoramas are formed (column 8, lines 18-58).

Claim 2 recites all the limitations of claim 1 and adds the limitation of "a focal length obtaining step." The Xiong reference teaches finding projective parameters such as 3D rotation parameters (pan, tilt roll), center of projection of images, ratio of focal lengths, and the like (column 10, lines 9-28). The Xiong reference implicitly teaches finding the camera internal parameters vector of which the focal length is a component (column 11, lines 15-42).

Claim 3 recites all the limitations of claim 1 and adds the limitation of "a changing step of changing the mapping mode." The Xiong reference teaches that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection onto a chosen viewing plane such as cubic, polyhedral, cylindrical and spherical geometries (column 8, lines 18-58).

Claim 4 recites all the limitations of claim 1 and adds the limitation of "issuing a warning." The Xiong reference teaches in figures 2 and 3 a user interface and a global optimization that provides feedback to the computer system such as issuing warning messages on the computer monitor 218 when the pair-wise objective function is not desirable for a poor selection of the projection viewing plane (and the resulting panoramas will have imperfectly aligned images that give shadow or ghosting effects) due to a poor selection of the projection viewing plane. The resulting panoramas will have imperfectly aligned images that give shadow or ghosting effects. Nevertheless, the Xiong reference points to a seamless multi-resolution

average blending method that would result in an absent of shadow effects (column 14, lines 1-45).

Claim 5 recites all the limitations of claim 1 and adds the limitation of "a displaying step of displaying a cuttable rectangular region." The Xiong reference teaches how to align images more precisely by changing the coordinates for positioning an image. The Xiong reference further teaches placing the images 1210 at selected tangents on the viewing sphere 1220 (figure 12, and column 17, lines 12-65).

4. Claim 6 recites "an image synthesis apparatus. The Xiong reference teaches in figure 3 an apparatus for image synthesis.

Claim 7 recites all the limitations of claim 6 and adds the limitation of "a focal length obtaining step." The Xiong reference teaches finding projective parameters such as 3D rotation parameters (pan, tilt roll), center of projection of images, ratio of focal lengths, and the like (column 10, lines 9-28). The Xiong reference implicitly teaches finding the camera internal parameters vector in his image synthesis apparatus of figure 3 because the focal length is a component of that vector (column 11, lines 15-42).

Claim 8 recites all the limitations of claim 6 and adds the limitation of "a changing step of changing the mapping mode." The Xiong reference teaches that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane such as cubic, polyhedral, cylindrical and spherical geometries (column 8, lines 18-58).

Claim 9 recites all the limitations of claim 8 and adds the limitation of "issuing a warning." The Xiong reference teaches in figures 2 and 3 a user interface and a global

optimization that provides feedback to the computer system such as issuing warning messages on the computer monitor 218, e.g., when the pair-wise objective function is not desirable (and the resulting panoramas will have imperfectly aligned images that give shadow or ghosting effects) due to a poor selection of the projection viewing plane. The resulting panoramas will have imperfectly aligned images that give shadow or ghosting effects. Nevertheless, the Xiong reference points to a seamless multi-resolution average blending that is absent of shadow effects (column 14, lines 1-45).

Claim 10 recites all the limitations of claim 8 and adds the limitation of "a displaying step of displaying a cuttable rectangular region." The Xiong reference teaches how to align images more precisely by changing the coordinates for positioning an image. The Xiong reference further teaches placing the images 1210 at selected tangents on the viewing sphere 1220 (figure 12, and column 17, lines 12-65).

5. Claim 11 recites a computer-readable storage medium having a program for implementing image synthesis method. The Xiong reference teaches a program residing in system memory 220 which stores output data and other data (column 3, lines 54-67).

Claim 12 recites all the limitations of claim 11 and adds "a focal length obtaining step." The Xiong reference teaches finding projective parameters such as 3D rotation parameters (pan, tilt roll), center of projection of images, ratio of focal lengths, and the like (column 10, lines 9-28). The Xiong reference implicitly teaches finding the camera internal parameters vector of which the focal length is a component (column 11, lines 15-42).

Claim 13 recites all the limitations of claim 11 and adds the limitation of "a changing step of changing the mapping mode." The Xiong reference teaches that panorama is constructed on a

particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane such as one of the cubic, polyhedral, cylindrical and spherical geometries (column 8, lines 18-58).

6. Claim 14 recites an image synthesis method comprising a generating step of generating coordinate-space transformation parameters. The Xiong reference teaches for example in a local pair-wise registration the estimation of parameters in a projective matrix which represents a coordinate transformation matrix (column 11, lines 1-46).

Claim 15 recites all the limitations of claim 14 and adds the limitation of "a changing instruction step of issuing a mapping mode changing instructions." The Xiong reference teaches that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane such as cubic, polyhedral, cylindrical and spherical geometries (column 8, lines 18-58). The Xiong reference further teaches calibration as the second major step in authoring panoramas to extract camera internal and external parameters from those projective matrices (column 12, lines 33-44). The Xiong reference discloses that the improved projective matrix parameters will in turn be used to generate improved estimation of camera parameters and blending may be further iterated after an initial blending (column 13, lines 53-67).

7. Claim 16 recites an image synthesis method comprising a reference position-setting step. The Xiong reference teaches a multi-resolution weighted average blending for perspective alignment (column 14, lines 2-45). The Xiong reference also teaches for example in column 11 setting or estimating camera orientation and the rotation matrix that is based on camera orientation.

8. Claim 17 recites all the limitations of claim 14 and adds the limitation of "a storage step of storing a generated panoramic synthesized image." The Xiong reference teaches panoramic canvas which can be simply be a buffer or memory in a computer system such as memory 220 of figure 2 and onto which the blended images is copied (column 15, lines 15-28).

9. Claim 18 recites an image synthesis apparatus comprising a generating means for generating coordinate-space transformation parameters and image synthesis means for combining the images. The Xiong reference teaches for example a pair-wise registration module 222 and the projection function module 228. The parameters in a projective matrix are estimated which represents an image coordinate transformation matrix. The projection function module 228 constructs a panoramic scene by projecting the blended image onto any designated geometry view surface (column 4, lines 21-52, and column 11, lines 1-46).

Claim 19 recites all the limitations of claim 18 and adds the limitation of "a changing means for changing the mapping mode." The Xiong reference teaches a projection module 228 residing in memory 220 and operating the processor 212 may be controlled through the user interface 230 to allow a user to select what geometry will be projected onto (i.e., changing the mapping mode) and to control and modify other factors, including the use of photo re-touching software such as PhotoShop for modifying the final panorama (column 4, lines 41-49).

Claim 20 recites all the limitations of claim 18 and adds the limitation of "a reference position setting means." The Xiong reference teaches for example in column 11 setting or estimating camera orientation on which the rotation matrix is based.

Claim 21 recites all the limitations of claim 18 and adds the limitation of "storage means for storing a generated panoramic synthesized image, coordinate transformation parameters and

coordinate-space transformation parameters." The Xiong reference teaches storage means such as panoramic canvas which can be simply a buffer or memory in a computer system such as memory 220 in figure 2 and onto which the blended images is copied (column 15, lines 15-28). The Xiong reference teaches that the improved projective matrix parameters (i.e., the coordinate and coordinate-space transformation parameters) can be used to generate improved estimation of camera parameters and blending may be further iterated after an initial blending (column 13, lines 53-67). Finally, the Xiong reference teaches projective parameters, e.g., 3D rotation parameters, center of projection of images, ratio of focal lengths, and an affine transformation in constructing a two-dimensional view of the environment (column 10, lines 16-28).

10. Claim 22 recites a computer-readable storage medium having a program for implementing image synthesis method and a generating step of generating coordinate-space transformation parameters. The Xiong reference teaches a program residing in system memory 220 which stores output data and other data (column 3, lines 54-67). The Xiong reference also teaches for example in a local pair-wise registration the estimation of parameters in a projective matrix which represents a coordinate transformation matrix (column 11, lines 1-46). Finally, the Xiong reference teaches that the improved projective matrix parameters will in turn be used to generate improved estimation of camera parameters and blending may be further iterated after an initial blending (column 13, lines 53-67).

11. Claim 23 recites an image synthesis method comprising an editing step and a storage step. The Xiong reference teaches a user interface that has fields for any and all internal and external parameters of the projection matrix of the images including aspect ratio, number of rows of images, the tilt between rows, the angle between photos within a row, the roll of each image

taken, image center position, focal length, camera orientation, the brightness and contrast of image, etc. The Xiong reference further teaches that a user may have the ability to adjust parameters for images captured with a particular methodology (column 9, lines 1-21). The Xiong reference also teaches panoramic canvas which can be simply a buffer or memory in a computer system such as memory 220 shown in figure 2 and onto which the blended images is copied (column 15, lines 15-28).

Claim 24 recites all the limitations of claim 23 and adds the limitation of "a mapping mode is changed." The Xiong reference teaches that panorama is constructed on a particular geometry that will best facilitate the rendering of the projection of the panorama onto a chosen viewing plane such as cubic, polyhedral, cylindrical and spherical geometries (column 8, lines 18-58).

Claim 25 recites all the limitations of claim 23 and adds the limitation of "an adjoining part of the image is corrected in editing step." The Xiong reference teaches determining the boundary of overlap regions in multi-resolution blending (column 14, lines 46-62). The Xiong reference also teaches a flowchart for the blending procedure resulting in a desired smooth effect and a grassfire transform on the panoramic canvas for the blending of more than two images (column 16, lines 40-67).

***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Szeliski et al. U.S. Patent No. 6,097,854 discloses an image mosaic construction system and apparatus with patch-based alignment.

b. Kumar et al. U.S. Patent No. 5,963,664 discloses a system for generating three-dimensional mosaics from a plurality of input images.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jin-Cheng Wang whose telephone number is (703) 605-1213. The examiner can normally be reached on 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Razavi can be reached on (703) 305-4713. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-6606 for regular communications and (703) 308-6606 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 395-3900.

jcw
September 25, 2002

MICHAEL RAZAVI
SUPERVISORY PATENT EXAMINER
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